QUARTZ

FORENSIC BLOOD TOXICOLOGY PROFICIENCY TESTING SCHEME

Scheme Description

LGC
Proficiency Testing
1 Chamberhall Business Park
Chamberhall Green
Bury
Lancashire
BL9 0AP
United Kingdom

Telephone: +44 (0) 161 762 2500
Email: axiopt@lgcgroup.com
Website: www.lgcstandards.com

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ISSUE	ISSUE DATE	DETAILS	AUTHORISED BY
9	22/07/11	Document updated for 2011/2012	M.Whetton
10	18/01/12	SDPA values updated for alcohol assessment. Appendix A updated.	W.Gaunt
11	July 2013	Removal of Appendix B and expansion of Scheme Aims and Sample Descriptions. Update of Sample 3. Change of scheme year.	K Morgan
12	Feb 2014	Clarification of traceability. Introduction of New Psychoactive Substance Sample and Alcohol Technical Defence. 'Methods' section added.	K Morgan
13	Dec 2014	New formulation of NPS (sample 6) for New scheme year.	K Morgan
14	Sept 2015	Addition of subcontracting information. Removal of hard copy report information.	K Morgan N Mason
15	Jan 2016	Addition of samples 7 (Synthetic cannabinoid sample) and 8 (Urine identification sample)	K Morgan
16	Jan 2017	New formulation of NPS (sample 6) for new scheme year and units removed for some samples in Scheme Description.	K Morgan
17	Jan 2018	SDPA units clarified for Sample 6 and sample updated. New sample added. Urine treatment has been included.	K Morgan
18	Dec 2018	Website information added to page 3 Sample 6 information updated	A McCarthy K Morgan
19	Nov 2019	Removed Standards from page 1 Updated accreditation status for sample 5 Sample 6 information updated	A McCarthy K Morgan
20	Sep 2020	Removed Fax number and info on hard copy report	A McCarthy
21	July 2021	Updated email address and UKAS logo Update to Sample 6 Update to Sample 3 Addition of Sample 10 Removal of reference to significant figures- sample 2 Addition of Sample 5 assessment information	A Collins K Morgan
22	Sept 2022	Removal of case scenario from Sample 2 and clarification of sample identities for Samples 3A, 3B, 10A and 10B.	K Morgan
23	July 2023	Amendments to Sample 3 and Sample 10 regarding distribution. Samples A and B for each sample to be distributed together, Samples 3 and 10 alternate quarterly.	K Morgan

Notes:
Where this document has been translated, the English version shall remain the definitive version

Scheme Aims and Organisation
The primary aim of the Forensic blood toxicology proficiency testing scheme (QUARTZ) is to enable laboratories performing the analysis of drugs in post-mortem and other blood samples for toxicological purposes, particularly in a forensic context, to monitor their performance and compare it with that of their peers. Case-types that will be covered by the scheme will include deaths, drug facilitated sexual assaults, impaired driving and other forensic toxicology criminal cases. The QUARTZ scheme also aims to provide information to participants on technical issues and methodologies relating to forensic toxicology.

The QUARTZ scheme year operates from January to December. Further information about QUARTZ, including test material availability, round despatch dates and reporting deadlines, are available on the current QUARTZ application form and on the website www.lgcstandards.com.

Test Materials
Test material batches are tested for homogeneity for at least one test parameter where deemed appropriate. Details of homogeneity tests performed and results are given in the QUARTZ Scheme Reports.

Samples are generally prepared using pre-screened human blood.

The non-clinical blood material is obtained from the National blood service and prior to use in the QUARTZ scheme is screened for:

- HEP B antigen
- HEP C antigen
- Combo HIV 1 and 2
- Syphilis
- Human T-lymphotropic virus (HTLV)
- Cytomegalovirus (CMV)

Urine is heated at 60°C for 1.5hr sample production.

Note: All test materials provided are intended for use as proficiency testing materials only and are not to be used for any other purposes.
Some aspects of the scheme, such as test material production, homogeneity testing and stability assessment, can from time to time be subcontracted. When subcontracting occurs, it is placed with a competent subcontractor and LGC is responsible for this work. The planning of the scheme, the evaluation of performance and the authorisation of the final report will never be subcontracted.

Sample PT-QZ-01 (Identification): Participants will be asked to identify up to 4 drugs relevant to forensic toxicology. The drugs chosen will include anaesthetics (e.g. ketamine), antidepressants (e.g. amitriptyline, dothiepin, citalopram), anticholinergics (e.g. procyclidine), anticonvulsants (e.g. carbamazepine, phenytoin, pregabalin), antihistamines (e.g. cyclizine, chlorpheniramine), antipsychotics (e.g. olanzapine, quetiapine), cardiovascular drugs (e.g. atenolol,flecainide), erectile dysfunction (e.g. sildenafil), opioid analgesics (e.g. morphine, methadone, oxycodone, tramadol), Non Steroidal Anti-Inflammatory Analgesics (e.g. salicylate, paracetamol, etoricoxib), benzodiazepines (e.g. diazepam, alprazolam, temazepam, flunitrazepam), hypnotic drugs (e.g. zaleplon, zolpidem, zopiclone), stimulants (e.g. cocaine, piperazines, amphetamines, APB, cathinones), cannabinoids, barbiturates, carboxyhaemoglobin. The sample will always contain at least one drug from the most commonly encountered drugs in forensic toxicology casework.

Sample PT-QZ-02 (Quantification and Case Study): Participants will be told the identity, or generic classification, of the drug(s), and asked to quantify the concentration. The drugs chosen will be from the same drug classes as those described for Sample 1 above. The sample will always contain at least one drug from the most commonly encountered drugs in forensic toxicology casework.

Sample PT-QZ-03 (Known Drug Blood Quantification Sample): This sample consists of two samples which are alternated each quarter at different concentrations. One of the samples contains 4 common drugs of abuse and the other sample contains 4 prescription drugs that are commonly encountered in forensic casework. No interpretation is required.

Sample 3A: Drugs of Abuse Sample
1 Morphine
2 Methadone
3 Amphetamine
4 Diazepam

Sample 3B: Prescribed Drugs Sample
1 Citalopram
2 Codeine
3 Amitriptyline
4 Tramadol

Sample PT-QZ-04 (Alcohol in blood): A blood sample containing a known concentration of ethanol is provided. Participants are requested to determine and report the concentration of the alcohol. Participants are also asked to report the concentration of fluoride in the sample.

Sample PT-QZ-05 (Alcohol Technical Defence): A paper based exercise for blood and breath alcohol concentrations.

Sample PT-QZ-06 (New Psychoactive Substances): This sample is distributed twice per year containing different substances. Up to four substances are to be identified by screening (quantification results may also be included).

Sample PT-QZ-07 (Synthetic cannabinoid sample: Identification sample): A blood sample containing a synthetic cannabinoid. Participants are asked to screen for synthetic cannabinoids and identify one of the most common synthetic cannabinoids. This sample is distributed twice per year with a different synthetic cannabinoid included in each distribution.

Sample PT-QZ-08 (Identification): Participants are asked to identify up to 4 drugs or metabolites relevant to forensic toxicology. The drugs chosen will include anaesthetics (e.g. ketamine), antidepressants (e.g. amitriptyline, dothiepin, citalopram), anticholinergics (e.g. procyclidine), anticonvulsants (e.g. carbamazepine, phenytoin, pregabalin), antihistamines (e.g. cyclizine, chlorpheniramine), antipsychotics (e.g. olanzapine, quetiapine), cardiovascular drugs (e.g. atenolol,flecainide), erectile dysfunction (e.g. sildenafil), opioid analgesics (e.g. morphine, methadone, oxycodone, tramadol), Non Steroidal Anti-Inflammatory Analgesics (e.g. salicylate, paracetamol, etoricoxib), benzodiazepines (e.g. diazepam, alprazolam, temazepam, flunitrazepam), hypnotic drugs (e.g. zaleplon, zolpidem, zopiclone), stimulants (e.g. cocaine, piperazines, amphetamines, APB, cathinones), cannabinoids, barbiturates, carboxyhaemoglobin. The sample will always contain at least one drug from the most commonly encountered drugs in forensic toxicology casework. Urine specimen.

Sample PT-QZ-09 (Identification): A urine sample specifically for New Psychoactive Substance screening and may include synthetic cannabinoids. Up to two substances may be present. No interpretation is required.

Sample PT-QZ-10 (Known Drug Blood Quantification Sample): This sample consists of two samples which are alternated each quarter at different concentrations. These samples contain commonly encountered drugs across a range of drugs types. No interpretation is required.

Sample 10A
1 Oxycodone
2 Pregabalin
3 MDMA
4 Mirtazapine

Sample 10B
1 Loratadine
2 Gabapentin
3 Quetiapine
4 Valproate

Statistical Analysis
Information on the statistics used in QUARTZ can be found in the General Protocol and in the Scheme Report. Methods for determining assigned values and the values for SDPA used for individual samples are given in Appendix A.

Methods
Methods are listed in Appendix A and PORTAL. Please select the most appropriate method from the list. If none of the methods are appropriate, then please report your method as ‘Other’ and record a brief description in the Comments Section in PORTAL.

Results and Reports
QUARTZ results are returned through our electronic reporting software, PORTAL, full instructions for which are provided by email.

QUARTZ reports will be available on the website within 10 working days of round closure. Participants will be emailed a link to the report when it is available.

APPENDIX A - Description of abbreviations used

Assigned Value (AV)

The assigned value may be derived in the following ways:

- From the robust mean (RMean). This is the median of participant results after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. Generally, the assigned value will be set using results from all methods, unless the measurement is considered method-dependant, in which case the assigned value will be set by method as illustrated in the report tables.
  For some analytes, where there is a recognised reference method for that type of measurement, this may be used as the assigned value for a particular analyte i.e. it would be applied to results obtained by any method.

  Traceability: Assigned values which are derived from the participant results, or a sub-set of the results are not traceable to an international measurement standard. The uncertainty of assigned values derived in this way is estimated from the participant results, according to ISO 13528.

- From a formulation value (Formulation). This denotes the use of an assigned value derived from sample preparation details, where known and exact quantities of analyte have been used to prepare the sample.

  Traceability: Assigned values calculated from the formulation of the test sample are traceable, via an unbroken metrological traceability chain, to an international measurement standard. The measurement uncertainty of the assigned value is calculated using the contributions from each calibration in the traceability chain.

- From a qualitative formulation (Qual Form). This applies to qualitative tests where the assigned value is simply based on the presence/absence of the analyte in the test material.

  Traceability: Assigned values calculated from the qualitative formulation of the test sample are traceable to a certified reference standard or a microbiological reference strain.

- From expert labs (Expert). The assigned value for the analyte is provided by an ‘expert’ laboratory.

  Traceability: Assigned values provided by an ‘expert’ laboratory may be traceable to an international measurement standard, according to the laboratory and the method used. The uncertainty of measurement for an assigned value produced in this way will be provided by the laboratory undertaking the analysis. Details of traceability and the associated uncertainty will be provided in the report for the scheme/round.

Range

This indicates the concentration range at which the analyte may be present in the test material.

SDPA
SDPA represents the ‘standard deviation for proficiency assessment’ which is used to assess participant performance for the measurement of each analyte. This may be a fixed value (as stated), a percentage (%) of the assigned value or based on the robust standard deviation of the participant measurement results, either across all methods or by method depending on whether the measurement made is method dependent (see assigned value).

Units
This indicates the units used for the assessment of data. These are the units in which participants should report their results. For some analytes in some schemes participants may have a choice of which units to report their results, however, the units stipulated in this scheme description are the default units to which any results reported using allowable alternative results will be converted to.

DP
This indicates the number of decimal places to which participants should report their measurement results.

Sample PT-QZ-01 **Identification of toxicology drugs**

Participants will receive: 10ml blood matrix, issued quarterly.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug identification	All	All	Qual Form	N/A	N/A	N/A

Sample PT-QZ-02 **Quantification of toxicology drugs and Case Study**

Participants will receive: 10ml blood matrix, issued quarterly.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug quantification	All	<0.1 mg/L	Formulation	25% of AV	varies depending on analyte	3
		0.1 to 10 mg/L		20% of AV		
		>10 mg/L		15% of AV		

Sample PT-QZ-03 (A & B) **Known Drug Blood Quantification Sample**

Participants will receive: 10ml blood matrix per sample, both samples issued biannually containing Drugs and Abuse and Prescription.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug quantification **Sample 3A**: Morphine, Methadone, Amphetamine Diazepam. **Sample 3B**: Citalopram, Codeine, Amitriptyline Tramadol	All	<0.1	Formulation	25% of AV	mg/L	2
		0.1 to 10		20% of AV		
		>10		15% of AV		

Sample PT-QZ-04 **Analysis of alcohol in blood (driving impairment)**

Participants will receive 10ml blood matrix

Method	Test	Range	AV	SDPA	Units	DP
Quantification of alcohol	All	≤ 100 >100	Formulation	3 mg/100ml 3% of AV	mg/100ml (mg%)	2
Quantification of fluoride	All	1.0 to 2.0	Formulation	RMean	%	2

Sample PT-QZ-05 **Alcohol Technical Defence**

Participants will receive: Information and/or analytical results provided for paper exercise

Analyte	Method	Range	AV	SDPA	Units	DP	Expected outcome
Alcohol in Blood Alcohol technical defence (ATD) “back calculations”	Interpretation	N/A	Robust Mean	N/A	N/A	N/A	Advisory

Note: The assessment will be based upon calculations described in the UKIAFT Guidelines for Performing Alcohol Technical Defence Calculations, UKIAFT ATD Guidelines. The individual reference will be included in each report in case of updates.

Sample PT-QZ-06** **New Psychoactive Substance (NPS) Blood Quantification Sample**

Participants will receive: 10ml blood matrix, issued every six months (two rounds per year).

Analyte	Method	Range (mg/L)	AV	SDPA	Units	DP
Drug identification, quantification may be undertaken if participant wishes.	All	All	Qual Form	N/A	N/A	N/A
		<0.1	Formulation	25% of AV	µg/L	2
		0.1 to 10		20% of AV		
		>10		15% of AV		

**Please note that this sample is not currently within our UKAS scope of accreditation.

Sample PT-QZ-07** **Synthetic Cannabinoid Blood Sample: Qualitative**

Participants will receive: 10ml blood matrix, issued every six months.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug identification	All	All	Qual Form	N/A	N/A	N/A

**Please note that this sample is not currently within our UKAS scope of accreditation.

Sample PT-QZ-8 **Identification of toxicology drugs/metabolites – Urine specimen**

Participants will receive: 10ml Urine, issued every six months.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug identification	All	All	Qual Form	N/A	N/A	N/A

Sample PT-QZ-9** **New Psychoactive and Synthetic Cannabinoid Urine Screen: Qualitative**

Participants will receive: 10ml urine matrix, issued every six months.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug identification	All	All	Qual Form	N/A	N/A	N/A

**Please note that this sample is not currently within our UKAS scope of accreditation.

Sample PT-QZ-10 (A & B) **Known Drug Blood Quantification Sample**

Participants will receive: 10ml blood matrix per sample, both samples issued biannually containing Drugs and Abuse and Prescription.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug quantification **Sample 10A**: Oxycodone, Pregabalin, MDMA and Mirtazapine **Sample 10B**: Loratidine, Gabapentin, Quetiapine and Valproate	All	<0.1	Formulation	25% of AV	mg/L	3
		0.2 to 10		20% of AV		
		>10		15% of AV		